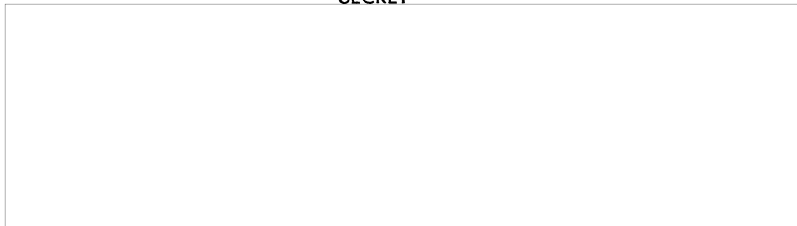
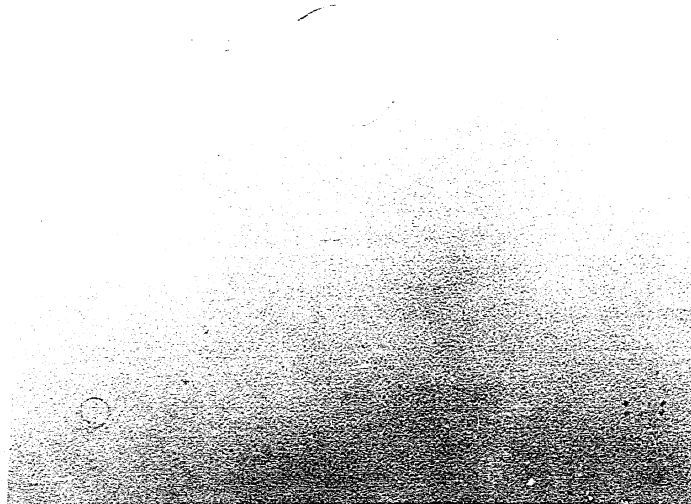


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**ORAGE BATTERY WATER
COOLING SYSTEM**
Description and Maintenance
Instructions
H641-A76-213



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I. DESCRIPTION

A. APPLICATION AND BASIC SPECIFICATIONS

The storage battery water cooling system is designed for cooling the electrolyte of the cells on charge and discharge when its temperature rises up to 35°-38°C.

The system consists of two cooling circuits of distilled and sea water.

The electrolyte is cooled by distilled water forced through coils located in the upper portion of the cells.

The distilled water is cooled in water cooler ONB-14 by sea water.

Distilled water is circulated by pump BWH-65V having a capacity of 30-40 m³/hr.

The sea water is forced through water cooler ONB-14 by main drainage pump 6MBx2.

WARNING: The cells are cooled only in the case of the series operation of pump 6MBx2 with a capacity of 75-90 m³/hr.
The operation of pump 6MBx2 in the parallel duty is not permissible.

The salinity of the distilled water in the system shall not exceed 1.0 mg/lit, which is maintained by ion-exchange resin.

The amount of distilled water in the system is about 1000 kg.

The amount of reserve distilled water in the distilled water tank is approximately 1 ton.

The working pressure in the distilled water circuit is up to 3.0 kgf/cm² and that in the sea water circuit is up to 1.0 kgf/cm².

The dimensions of the copper pipes in the compartments are 8 x 1.5; 9 x 1.5; 14 x 1.5; 22 x 2; 24 x 2; 32 x 2;

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65 x 2; 75 x 2; 85 x 2 and the dimensions of the copper-nickel pipes are 110 x 5 mm. The dimensions of the polyethylene pipes in the battery wells are 50 x 8 and 90 x 14 mm.

The fittings of the distilled water piping are of brass and those of the sea water piping are of bronze.

Use is made of rubber gaskets 3 mm thick for the flanged joints of the copper and polyethylene pipes rated at a pressure of 3.0 kg/cm². For the other joints use is made of paronite gaskets 1.0 mm thick.

The sea and distilled water pipe lines are tested by a hydraulic pressure the value of which is specified in the system diagram (see Appendix I).

CHARACTERISTICS OF MAJOR EQUIPMENT EMPLOYED IN SYSTEM

1. Distilled Water Pump

Pump designation (model)	BWH-65V
Pump type	vertical, centrifugal, single-stage, electric- driven
Capacity	30-40 m ³ /hr
Total head (delivery + intake).....	20 m H ₂ O min.
Rotational speed at 220 V	3000 r.p.m.
Static lift	5 m of water
Pump shaft power	4.0 kW max.
Pump weight as delivered	142 kg
Pump weight in operating condition....	152 kg

2. Ion-Exchange Filter

Designation	ΦM2
Filter type	with mixed charge
Output	0.4-2.0 m ³ /hr
Working pressure of water upstream	
.....	3 kg/cm ² max.
Flow resistance of filter	1 kgf/cm ² max.

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Content of chlorine ions in
 water downstream of filter 0.05 mg/lit max.
 Filter inner diameter 292 mm
 Height of filter charge 900 mm
 Volume of filter charge 0.06 kg
 Volume of drainage bed 3.3 lit.
 Filter capacity in terms of
 NaCl 0.66 kg
 Dry filter weight as delivered .. 110 kg
 Filter weight in operating
 condition 195 kg

3. Water Cooler ONB-14

Designation ONB-14
 Cooler type surface-type with straight
 tubes, horizontal
 Amount of cooled distilled
 water 30-40 t/hr
 Amount of cooling sea water 75-90 t/hr
 Maximum temperature of distilled
 water at inlet 37°C
 Maximum temperature of distilled
 water at outlet 32.5°C
 Rated temperature of cooling
 sea water at inlet to cooler .. 28°C
 Working pressure of cooled dis-
 tilled water 3 kgf/cm² max.
 Working pressure of cooling
 sea water 30 kgf/cm² max.
 Hydraulic resistance of distil-
 led water space 4 m of water max.
 Hydraulic resistance of cooling
 sea water space 5 m of water max.
 Cooling surface 14.5 m²
 Tube dia. 10 x 1 mm
 Dry cooler weight (as deliver-
 ed) 560 kg

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Cooler weight in operating condition 690 kg
 Number of passes of cooled distilled
 water 8
 Number of passes of cooling sea water ... 2

B. DESCRIPTION OF SYSTEM AND ITS INDIVIDUAL UNITS

1. Water Cooling System

The storage battery water cooling system is located in compartments I, II, III and IV. It consists of the following pipe lines:

- (a) cooling distilled water pipe line;
- (b) distilled water purification pipe line;
- (c) distilled water inlet pipe line;
- (d) sea water pipe line.

Cooling Distilled Water Pipe Line

The cooling distilled water pipe line runs from pump BWH-65V in compartment III and consists of delivery and drain pipes (mains).

The delivery pipe with valve 19 is branched into two pipes running to compartments II and IV.

The delivery and drain pipes are provided with valves 14, 15, 17, 18, 26, 27, 28, 29 which are designed to disconnect the polyethylene pipes in the battery wells when flooding the adjacent compartments or in case of leaks in the joints of the pipes and hoses in the wells. The pipe line in the battery wells is made up of polyethylene pipes and manifolds. The joints between the polyethylene manifolds and the cell coils as well as between the coils themselves are rubber-can-vas hoses.

The cold distilled water runs from the delivery manifolds through the coils of all cells connected by rubber-can-vas hoses in series in groups of 2 or 3 cells each. The

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water heated in the cells is delivered to the drain manifolds and then to the drain mains of compartments II and IV.

In compartment III the drain pipes from compartments II and IV are combined in one pipe with valve 5 which runs to cooler OWR-14. The water is cooled in the cooler and then delivered to pump BUH-65V in which terminates the cooling distilled water pipe line.

An expansion tank, connected by a tube through valve 23 to the intake pipe of pump BUH-65V, is provided to compensate for the variations in the volume of distilled water in the pipe line due to its expansion with the increase in temperature, as well as for the variations in the volume of the system itself under pressure due to the expansion of the rubber-canvas hoses.

Valves 20, 22 and 25 are used for ventilating the system when it is being filled. Besides, the air left in the system after it has been filled is continuously bled during operation by the pipes through valve 22 into the expansion tank whence it is discharged by the tank ventilation tube into the compartment.

A branch with valve 16 is provided in compartment IV on the delivery main for discharging the water into the contaminated water tank when the system is being drained.

Pipe Line of Distilled Water Purification

The distilled water purification pipe line runs from the delivery main in compartment II to ion-exchange filter #22 in compartment I, where the water is demineralized and whence it is delivered back to compartment II, to the drain main, through a pipe with valve 32.

The purification of water may be accomplished only in case pump BUH-65V operates.

Valves 32 and 34 are designed to disconnect the filter and valve 35 is used to shut off the pipe line when the tank is being filled and to shut off the system when it is being filled through the ion-exchange filter.

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Valve 31 with a hose connection is designed to blow the system with compressed air when it is drained.

Distilled Water Inlet Pipe Line

The distilled water inlet pipe line is located in compartment I. It consists of a distilled water tank, an inlet pipe with valves 36 and 37 and a vent pipe with valve 4.

The vent pipe is provided with a branch having valve 3 for blowing the tank and a branch having safety valve 1.

The inlet pipe line is used for filling the system and distilled water tank from a shore source.

The system may be filled through the ion-exchange filter from the distilled water tank or from a shore source in case the salinity of water exceeds 3.7 mg/lit. Besides, the system is allowed to be drained through valve 37 and the hose into the bilge of the first compartment.

Sea Water Pipe Line

The sea water pipe line is arranged in the third compartment. It consists of three pipes with valves 6, 7, 10 and permits sea water to be forced through water cooler ONB-14 by main drainage pump 6MBx2.

2. Water Cooler ONB-14

(See Appendix 2)

The distilled water cooler is made as a double-pass heat exchanger for the cooling sea water and an eight-pass heat exchanger for the cooled distilled water.

The cooler consists of shell 1, cover 2 with connections, blind cover 3 and tubes 6 rolled and expanded in tube plates 4 and 5. The cylindrical shell of the cooler is welded of stainless steel.

Welded to the shell are connections 8 and 9 for inlet and outlet of the distilled water and supports 11 for fastening the cooler to the foundation plate. Eight passes of the distilled water in the shell are formed by means of longitudinal partitions 7 welded to the shell.

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German silver tubes 6 of the cooler are straight. To ensure a proper tightness and to prevent the ingress of cooling sea water into distilled water in case the rolled joints become leaky, tubes 6 are expanded in double tube plates 4 and 5.

The cooler covers are cast of bronze.

Front cover 2 is provided with bosses for inlet and outlet of the cooling sea water and with partition 10 allowing for the double-pass flow of the cooling sea water through the cooler tubes.

Rear cover 3 is blind.

To safeguard the cooler components against electrolytic corrosion, provision is made for protectors 12 in the covers, four being in each cover.

The tightness of all joints is ensured by paronite gaskets 17, 18, 19, 20, 2.0 mm thick.

When installing the cooler, plugs 13 should be screwed out to drain the sea water.

Plug 15 is designed to drain the distilled water.

Plug 14 is a vent plug.

Screws 16 are designed to facilitate the removal of the covers.

3. Ion-Exchange Filter QW2

(See Appendix 3)

The ion-exchange filter is designed for the fine chemical purification of water.

The filter is essentially cylindrical casing 1 with welded-on flanges attached to which at the top and bottom are covers 2, 3 and screens 4, 5.

Installed in top screen 4 are perforated caps 6 with 1.5 mm dia. holes for the uniform distribution of the filtered water over the sectional area of the filter.

Slotted caps 7 with slots $0.3^{+0.1}_{-0.05}$ mm wide are installed in bottom screen 5 to ensure a uniform collection of the filtered water and to prevent entrainment of the filter area and to prevent entrainment of the filter area.

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Top cover 2 of the filter carries air release valve 8 and filtered water inlet connection 9.

Bottom cover 3 is provided with water-sampling and filter-drain valve 10 and filtered water outlet connection 11. Spare welded-on boss 13 is available in the upper portion of filter casing 1 and cock 12 is provided in its lower portion for the hydraulic discharge of ion-exchangers.

The space between screens 4, 5 is filled with filtering charge 14. Slotted caps 7 are filled with drainage bed 15 of cut wire to prevent the slots of the caps being clogged by the grains of ion-exchangers.

The filter is held down to the foundation plate by means of two removable feet.

The water to be purified is fed into the upper portion of the filter and through the water distributor it enters the filter casing and passes through the filtering charge.

As the result of the processes occurring in the charge the water becomes demineralized and flows out of the filter through caps 7 and outlet connection 11.

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Before installation of the instruments, a sample of water taken of temperature, pressure, level of the battery tank and a sample of the distilled water.

Indicated below are the data of the instruments.

Table No.1

No.	Purpose, description and type of device (rel)	Type of transmitter	Type of indicating instrument and scale range	Normal value U1- timate value, red line	Values and purpose of setting	Place of installation of indicating instrument and description of panel	Note
1	2	3	4	5	6	7	8
1	Measurement of temperature of distilled water fed into battery wells TK-100-100	-	TK-100-100, 0-100°C scale	$\frac{20^{\circ} - 35^{\circ}\text{C}}{35^{\circ}\text{C}}$	-	Bilge of compartment III	-
2	Measurement of pressure in pipe line downstream of filter ФИ2. Pressure gauge, type MTK-100B	-	MTK-100B, 0-6 kgf/cm ² scale	$\frac{0-1,2 \text{ kgf/cm}^2}{3,0 \text{ kgf/cm}^2}$		Bilge of compartment I	-
3	Measurement of pressure in pipe line upstream of filter ФИ2. Pressure gauge, type MTK-100B	-	MTK-100B, 0-6 kgf/cm ² scale	$\frac{0,5-2,2 \text{ kgf/cm}^2}{3,0 \text{ kgf/cm}^2}$		Bilge of compartment I	-

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1	2	3	4	5	6	7	8
4	Check-up of system for pressure of water. Unit БДGV-1K	ДТЕ-1K	ДGV-1K	0.5-0.9 of tank capacity 0.1 of tank capacity	0.1 of tank capacity is minimum permissible level - light signal to control station of water cooling system	Bilge of compartment I	
5	Measurement of water salinity in system. Set СЖК-56p	ДC-58	МBC-49 0-20 mg/lit scale	<u>2.5-3.0 mg/lit</u> 3.7 mg/lit	-	Lower space, compartment III	
6	Measurement of water salinity at filter outlet. Set СЖК-56p	ДC-58	МBC-49 0-20 mg/lit scale	<u>0-0.05 mg/lit</u> 1.0 mg/lit	-	Upper space, compartment I	

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II. MAINTENANCE INSTRUCTIONSA. GENERAL SUPERVISION AND CARE

1. Daily check the water level in the expansion tank. The level must be within 0.5 and 0.9 of the tank capacity. Make up the system with water, when necessary. If the level constantly drops, check all joints of the system for leakage.

2. Daily check the salinity of the distilled water. Measure the salinity after priming the system by pump BHH-65V for ten minutes. In case the water salinity is in excess of 3.0 mg/lit, purify the water in the system. Daily increase of the distilled water salinity should not exceed 0.7 mg/lit.

3. Before the cruise check the purifying capacity of the ion-exchange filter, for which purpose switch on the system for purification and after ten minutes measure the water salinity downstream of the filter. If the water salinity is 0.5 mg/lit and over, replace the ion-exchanger charge of the filter.

B. PREPARATION FOR OPERATION

The system should be set in its initial position to be ready for starting.

1. Initial Position

4. The system and distilled water tank are filled with water.

5. The level in the expansion tank must be at least 0.5 to 0.9 of the tank capacity.

6. The salinity of the distilled water must be 3.0 mg/lit max.

7. Battery well shut-off valves 14, 15, 17, 18, 26, 27, 28 and 29, cooler valves 5 and 19, salt meter pick-up

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valve 21, level indicator valve 24, expansion tank valve 23 and mains constant ventilation valve 22 are ^{open} closed and provided with seals.

8. The three-way cocks are set so as to permit the water to flow through filters CK-57 and transmitters DC-58.

Valves 2, 20, 25, 33 and 36 are closed and provided with seals, the other valves being closed.

2. Filling the Distilled Water Tank

The distilled water tank is filled from a shore source with distilled water having a salinity of 3.0 mg/lit max.

To fill the tank, proceed as follows.

9. Connect the distilled water inlet hose to valve 37 having removed the blank-off nut.

10. Open valves 4, 36 and 37.

11. Check the amount of water taken with the aid of a depth gauge, avoiding its contamination and ingress of dirt into the tank.

12. On filling the tank, close valves 4, 36, 37, disconnect the hose and screw the blank-off nut onto valve 37.

3. Charging the Filtering Medium into Filter

Before charging the filter, wash and drain it. Take particular care of the condition of the slotted caps and drainage bed.

To charge the filter, proceed as follows.

13. Prepare a mixed charge of ion-exchangers in a swollen state, composed of cation-exchanger KV-2-Sv, 28 lit. (the weight of dry cation-exchanger being 20 kg) and anion-exchanger AB-17v, 28 lit. (the weight of dry anion-exchanger being 10 kg).

14. Remove the top cover and the top screen of the filter.

15. Charge the drainage bed and smooth it out.

16. Fill the filter with 10 to 15 lit. of distilled water.

17. Charge the ion-exchangers with the aid of a flexible hose or directly from a reservoir.

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18. Install the top cover and screen in place.
19. Fill the distilled water filter from a shore source (see Para.28) or from the distilled water tank (see Paras. 34-36,) having additionally opened valves 33 and 34.

4. Discharging the Filtering Medium from Filter

To discharge the filtering medium, proceed as follows.

20. Remove the blank-off nut from the ion-exchanger discharging cock.
21. Feed distilled water into the filter from a shore source (see Para.28) or from the distilled water tank (see Paras.34-36).
22. Close valves 22 and 23.
23. Open valves 32 and 35.
24. Open the ion-exchanger discharging cock on the filter and discharge the ion-exchangers into a portable reservoir.
25. After the ion-exchangers stop flowing from the filter and pure water (free from ion-exchangers) starts emerging, stop delivering the water to the filter.
26. Close valves 32 and 35, open valves 22 and 23 and drain the water left in the filter through the ion-exchanger discharging cock and valve 2. Close the ion-exchanger discharging cock and fit the blank-off nut.
27. In case the filter is to be off duty for a long period of time, remove the bottom cover and screen, discharge the drainage bed and wash it, examine and clear the drainage bed. Thereupon install the bottom cover and screen, remove the top cover and screen, fill the drainage bed, and install the top screen and cover.

5. Filling the System

The system is filled from a shore source or from the distilled water tank. If the salinity of water taken is more than 2.0 mg/lit, the system should be filled through the ion-exchange filter.

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Feed water having a salinity of over 5.0 mg/lit is not allowed to be taken aboard.

For taking the water from a shore source or from the tank it is necessary to prepare the distilled water pipe line in compliance with the maintenance instructions on the drinking, washing and sanitary water system and the storage battery filling pipe line.

(a) Filling the System from Shore Source

For filling the system from a shore source, proceed as follows.

28. Remove the blank-off nut from valve 37, connect the shore-to-ship water inlet hose and open valve 37.

29. When filling the system through the ion-exchange filter, open valves 30 and 32 taking care to ensure that the pressure difference between the pressure gauges upstream and downstream of the ion-exchange filter does not exceed 1.0 kg/cm².

If the filter is by-passed in filling the system, open valve 35.

30. Open valves 20 and 25 to relieve the air when filling the system.

31. As soon as the expansion tank is filled with water to its full capacity, close valve 37.

32. To evacuate the air left in the system, switch on pump BHH-65V and watch the level in the expansion tank. When the level drops down to the value at which level indicator RGV-1K operates, switch off the pump, open valve 37 and replenish the system.

The system is considered filled with water to its full capacity in case the water level in the expansion tank remains constant during ten minutes with valve 37 closed and pump BHH-65V operating.

33. On filling the system, set it to its original position.

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(b) Filling the System from Tank

For filling the system from the distilled water tank, proceed as follows.

34. Connect to valve 3 the hose running from the pipe line supplying the air to the distilled water tank.
 35. Open valve 3.
 36. Feed the air to the tank as directed in the maintenance instructions on the drinking, washing and sanitary water system and the storage battery filling pipe line, and maintain the pressure in the distilled water tank at a level of not over 1.0 kg/cm².
 37. Open valve 36.
- In filling the system through the ion-exchange filter, turn on valves 30 and 32 and in filling the system past the filter, open valve 35.
38. Open valves 20 and 25 to relieve the air when filling the system.
 39. As soon as the expansion tank is filled with water to its full capacity, close valve 36 and stop delivering the air to the tank.

40. To evacuate the air left in the system, turn on pump BMH-65V and watch the level in the expansion tank.

When the level drops down to the value at which level indicator RGV-1K operates, turn off the pump, open valve 36 and replenish the system.

The system is considered filled with water to its full capacity in case the water level in the expansion tank remains constant during ten minutes with valve 36 closed and pump BMH-65V operating.

41. Relieve the air from the tank through valve 4 and bring the system to its initial position.

6. Purification of Distilled Water in System

The purification of the distilled water in the system should as a rule be synchronized with the modes of the system operation for cooling the storage battery.

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In case a necessary arises for purifying the water between the cooling cycles, put the system into operation and start pump BLH-65V without feeding the sea water to cooler OHB-14.

42. Prior to turning on the ion-exchange filter for purification, start pump BLH-65V and make certain it operates normally.

43. Open valves 30, 34 and 35.

44. While slowly opening valve 32, set the pressure drop between the pressure gauges upstream and downstream of the ion-exchange filter to be 1.0 kg/cm² max.

45. Check the salinity of water in the system and at the outlet of the ion-exchange filter against the salt meters of compartments I and III. If the salinity of water at the filter outlet is 0.5 mg/lit and over, change the filter charge.

46. If the salinity is as high as 2.5 mg/lit, close valves 30, 32, 34 and 35, put out pump BLH-65V (in case it was engaged specially for purifying the water).

Note: If the purification of the distilled water in the system is synchronized with the operation of the system for cooling the storage battery, cut off the ion-exchange filter only when the salinity attains a value of 2.5 mg/lit.

C. STARTING, MAINTENANCE DURING OPERATION AND STOPPING

The necessity for cooling the storage battery is specified by the maintenance instructions on the storage battery. To start the system for cooling the storage battery, proceed as follows.

47. Turn on pump BLH-65V.

48. Let the sea water flow through cooler OHB-14, for which purpose:

- open Kingston valve 8 and valves 6, 7 and 10;
- prepare the drainage system;

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- open inlet kingston valve 11, valve 12 of the two-valve box, valve 9 (for number references see Appendix No.1) and switch on pump 6MBX2 as outlined in the maintenance instructions on the ship's drainage system.

49. Watch the level in the expansion tank.

50. Maintain the temperature of the distilled water (as read by the thermometer) as low as possible but not below 20°C to avoid sweating of the pipes in the wells. For this purpose control the rate of flow of the sea water by valve 13 of the drainage system.

51. On completion of the cooling cycle, turn off the pumps and bring the system to its initial position.

D. MAINTENANCE DURING LONG INACTION PERIOD

The storage battery water cooling system may stand idle for a long period of time both in the operating (filled) and drained condition.

When the system is in its operating condition, the supervision and care should be carried out in accordance with section A at the beginning of this chapter.

When the system is in the drained condition, all valves must be closed.

The ion-exchange filter may stand idle both in the charged and discharged condition. In the case of a prolonged idleness of the filter in the charged condition, take steps to prevent water leakage from the filter and make provision for filling the filter with distilled water.

When replacing the storage battery, dismantle the polyethylene pipes and manifolds in the battery wells.

Before the disassembly the system should be fully drained.

After the assembly the system should be filled and tested for tightness.

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1. System Drainage

The system is drained into the contaminated water tank through valve 16.

The water is allowed to be discharged into the distilled water tank through valve 36, if the salinity of the water in the system is below 3.7 mg/lit, as well as into the bilge of No.I compartment through valve 37 and the charging hose.

In draining the system, do as follows.

52. Drain the water from the expansion tank into the bilge of No.III compartment, for which purpose turn the plug of the three-way cock upstream of filter 4CK-57 to the position corresponding to the flow of water from the delivery pipe of pump BMH-65Y into the funnel. As soon as the expansion tank has been drained, put the plug of the three-way cock to the initial position and close valves 22 and 23.

53. Close valves 14, 15, 17, 18, 19, 21, 5, 26, 27, 28 and 29.

54. Connect to valve 31 the hose from the pipe line supplying the air to the fresh water tank.

55. Open valve 31, feed the air as directed in the maintenance instructions on the drinking, washing and sanitary water system and the storage battery filling pipe line and maintain the pressure in the cooling pipe line at 1.0 kg/cm².

56. Open one of valves 16, 36, 37 to drain water to the required tank or bilge.

57. Alternately open and close the following pipe line drainage valves:

valves 28 and 29 in the wells of the first group;
valves 26 and 27 in the wells of the second group;
valves 5, 19 and 21 in the No.III compartment and in cooler OMB-14;

valves 17 and 18 in the wells of the third group;
valves 14 and 15 in the wells of the fourth group.

These valves are closed when the air appears from valves 16 and 37 in the course of drainage into the contaminated water tank and into the bilge of the No.I compartment or when the air enters the distilled water tank through valve 36.

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58. On completion of the drainage stop delivering the air, disconnect the hose and bring the system into its initial position.

59. Drain the water left in the system through the drain plugs and through the rubber hoses in the wells, disconnecting them in the lowest places.

2. Disassembly and Reassembly of Pipe Line in Battery Wells

60. All removed pipe lines and manifolds should be marked according to the wells and to their arrangement in the wells.

61. When carrying out the disassembly, have in mind that the drainage of the system by air may be incomplete, therefore during the disconnection of the hoses the remaining water should be drained into a portable reservoir.

62. The disassembled polyethylene pipes and manifolds, as well as the rubber hoses should be flushed with distilled water, dried and stopped with wooden plugs.

63. The polyethylene pipes and manifolds should be stored in warehouses on racks protected against direct sun rays and at a safe distance from the heating appliances.

64. The exposed ends of the pipe left in the battery wells should be stopped with wooden plugs.

The reassembly of the pipe line should be carried out after installing and wedging the storage battery.

65. Remove dust and dirt from the external surface of the pipes, manifolds and hoses.

66. Remove the blanking covers, taking care to prevent the ingress of dirt, install the pipes and manifolds according to the marking and connect the rubber hoses.

3. Testing the System for Tightness

Procedure for Testing the Distilled Water Pipe Line

Before testing the pipe line, fill it with distilled water.

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79. Test the sea water pipe line in compliance with the maintenance instructions on the ship's drainage system. In this case open valve 10 and close valve 6.

B. TROUBLES AND REMEDIES

80. Common troubles, their causes and remedies are summarized in Table No.2 below.

T a b l e No.2

No.	Trouble	Cause	Remedy
1	Constant drop of water level in expansion tank	Leaky fittings or joints	Trace leaky point and correct fault
2	With valve 13 closed and pump 6MBx2 operating cooler, distilled water temperature is above 35°C	Clogged tubes of cooler OMB-14	Remove covers and sponge cooler tubes
3	When water in system is being purified, readings of one of salt meters are invariable	Clogged filter CK-57 or salt meter pick-up contaminated	Turn plug of three-way cock upstream of pick-up to position corresponding to flow of water through pick-up past filter CK-57. If salt meter readings fail to vary, pick-up is out of order. Disassemble and rinse it. If readings vary, filter CK-57 is

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No.	Trouble	Cause	Remedy
4	Poor purification of water - during one hour of filter operation salinity of water in system decreases by less than 10 per cent	(a) Contamination of top layer of ion-exchangers (b) Congestion of ion-exchangers in the course of cleaning (c) Improper drainage bed and slotted caps clogged with ion-exchanger grains	clogged. Rinse filter, for which purpose set plugs of three-way valves to position corresponding to flow of water through filter into drain pipe. Turn off filter. Drain water from filter. Remove top cover and screen, examine surface of ion-exchanger. If it is badly contaminated, remove small layer (50-100 mm) of contaminated ion-exchanger from filter. Install screen and cover in place and put filter into operation. In case troubles fail to be eliminated after taking corrective actions as stated above do as follows: turn off filter, discharge ion-exchangers from filter and check condition of slotted caps and drainage bed Turn off cooler (close valves 6,10). Remove cooler covers and examine pipes. Damaged pipes have to be plugged or cooler must be replaced.
5	Constant rise of distilled water level in expansion tank and intensified increase of distilled water salinity.	Getting of sea water into cooler due to damage of pipes	

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F. PERIODIC INSPECTIONS AND SCHEDULED PREVENTIVE MAINTENANCE

Daily Inspection

81. Examine the pipe lines, valves and measuring instruments having cleaned them of dust and dirt, make certain they are serviceable and any draught is avoided.
82. Make certain the sealed valves and measuring instruments are provided with seals.
83. Make certain the valves are in their original positions.
84. Check the light signalling system for proper condition.

Weekly Inspection

Carry out all the operations of the daily inspection and besides do as follows:

85. Turn over all the valves other than the sealed ones. Work the valves that run stiff.
86. Check the gland packing of the valves for proper condition and tighten the glands, if required.

Monthly Inspection

Carry out all the operations of the weekly inspection and in addition:

87. Turn over the sealed valves, work the valves that run stiff and then seal them again.
 88. Check the rubber-and-metal welded connections and flanged joints of the pipe lines for proper condition and attachment.
- If leaks are revealed, tighten up the joints and renew the gaskets, if required.

Quarterly Inspection

Carry out all the operations of the monthly inspection and in addition:

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89. Make certain the depth gauge in the tank is clean and serviceable.

90. Check the protectors of water cooler ONB-14 for condition, clean them of oxides.

In case the protectors wear out to 50 per cent, renew them.

91. Check salinity of the water in the tank. If the salinity is in excess of 3.7 mg/lit, change the distilled water.

When changing the distilled water, inspect and clean the tank.

Annual Inspection

Carry out all the operations of the quarterly inspection and in addition:

92. Remove the safety valve and check it for adjustment.

93. All the pressure gauges should be checked and provided with seals. In case the sealing has been disturbed or the term of check-up has expired, deliver the pressure gauges for checking or replace them.

Inspection during Routine Maintenance

94. Overhaul and, if necessary, repair the cut-off valves and cocks or replace them.

95. Restore the paint coating of the pipe lines and indicators of the direction of rotation of the valves and r.p.m., as well as the marking of the identification plates.

96. Test the reassembled system for tightness.

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G. REFERENCE DATA

List of Reference Documents

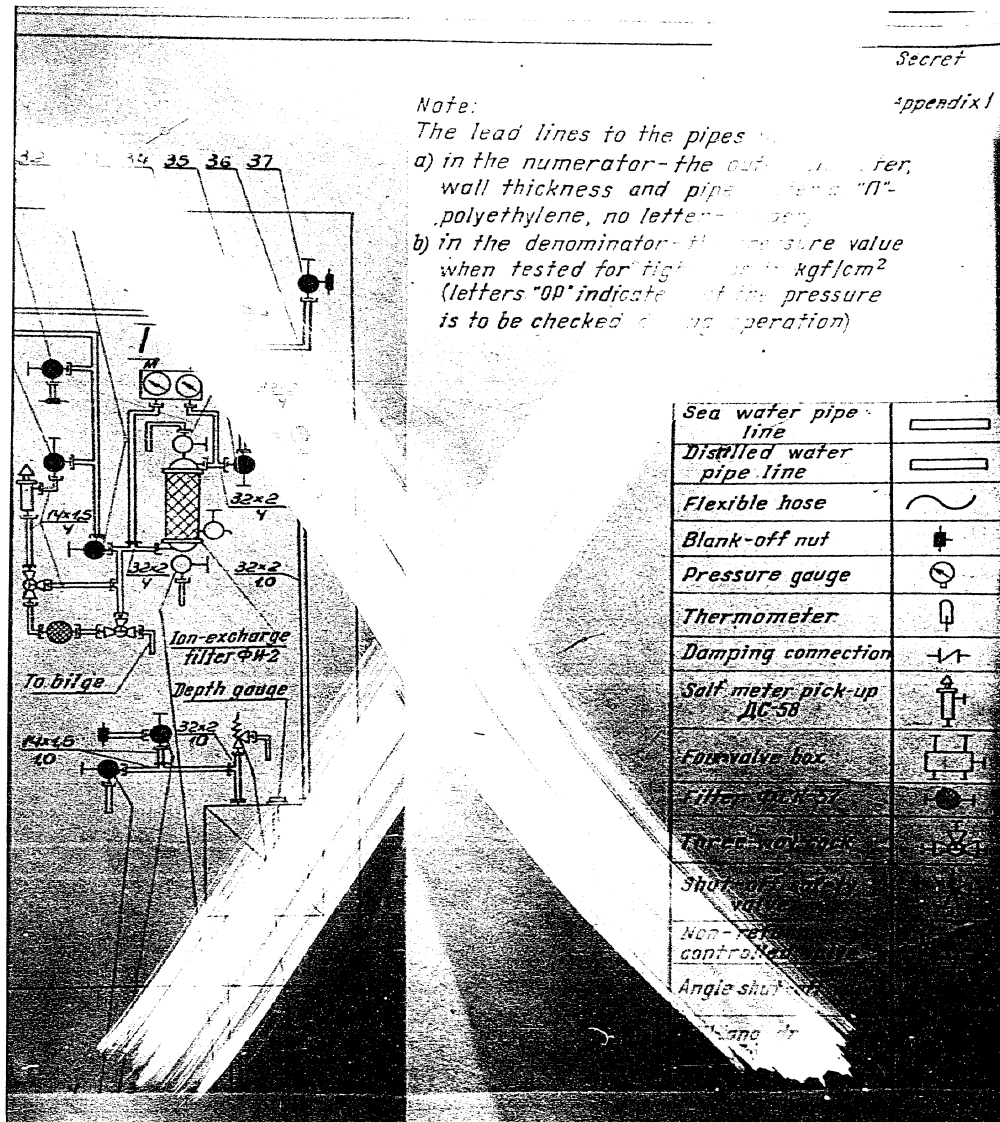
No.	Document name	Document No.	Remarks
1	Storage battery description and maintenance instructions		
2	Ship's drainage system description and maintenance instructions		
3	Washing, drinking and sanitary water system and storage battery filling pipe line. Description and maintenance instructions.		
4	Signalling circuitry used to indicate lower level of cooling water in storage battery cooling system		
5	Lay-out of salt meters of storage battery cooling system		

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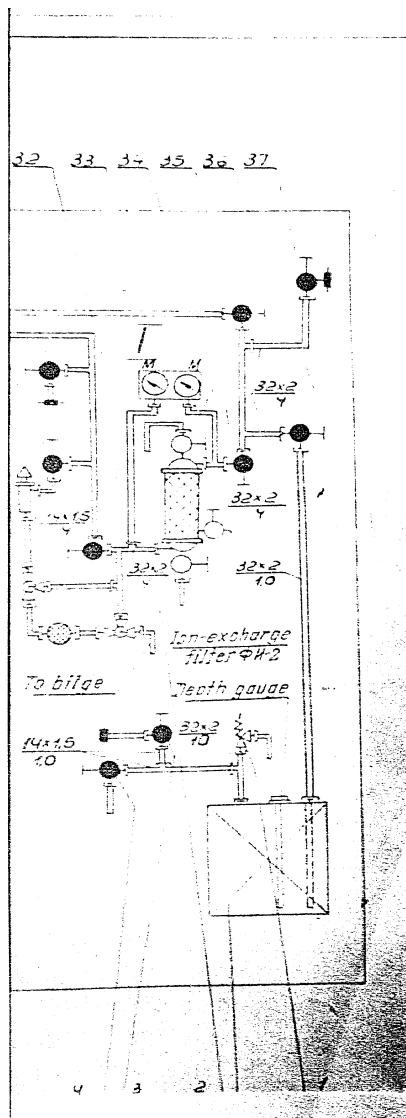


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The data lines to the pipes indicate:
 a) in the numerator - the outer diameter
 wall thickness and pipe material (P - polyethylene, no letter - copper);
 b) in the denominator - the pressure value
 when tested for tightness in kg/cm².
 Letters "OP" indicate that the pressure
 is to be checked during operation.

Sea water pipe line	
Distilled water pipe line	
Flexible hose	
Blank-off nut	
Pressure gauge	
Thermometer	
Damping connection	
Salt meter pick-up DC-58	
Four-valve box	
Filter ΦCK-57	
Three-way cock	
Shut-off safety valve	
Non-return controlled valve	
Angle shut-off valve	
Fill-and-drain Kingston valve	

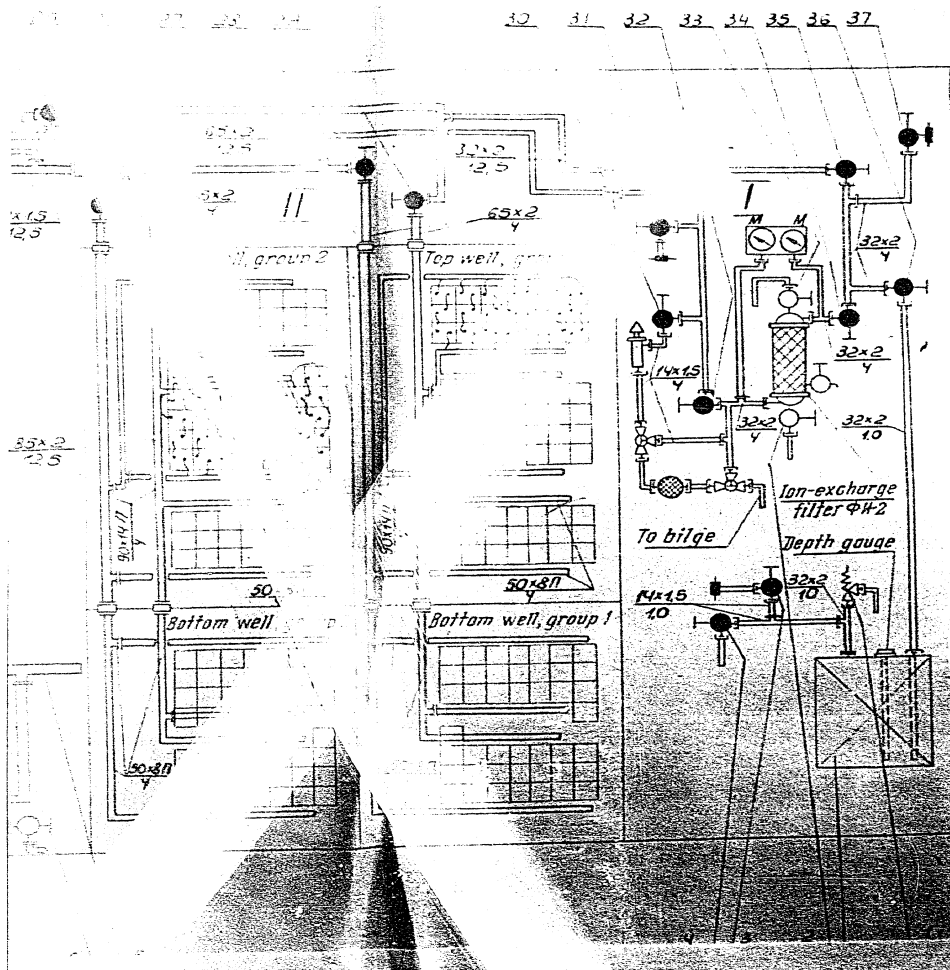
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Dry Water Cooling System

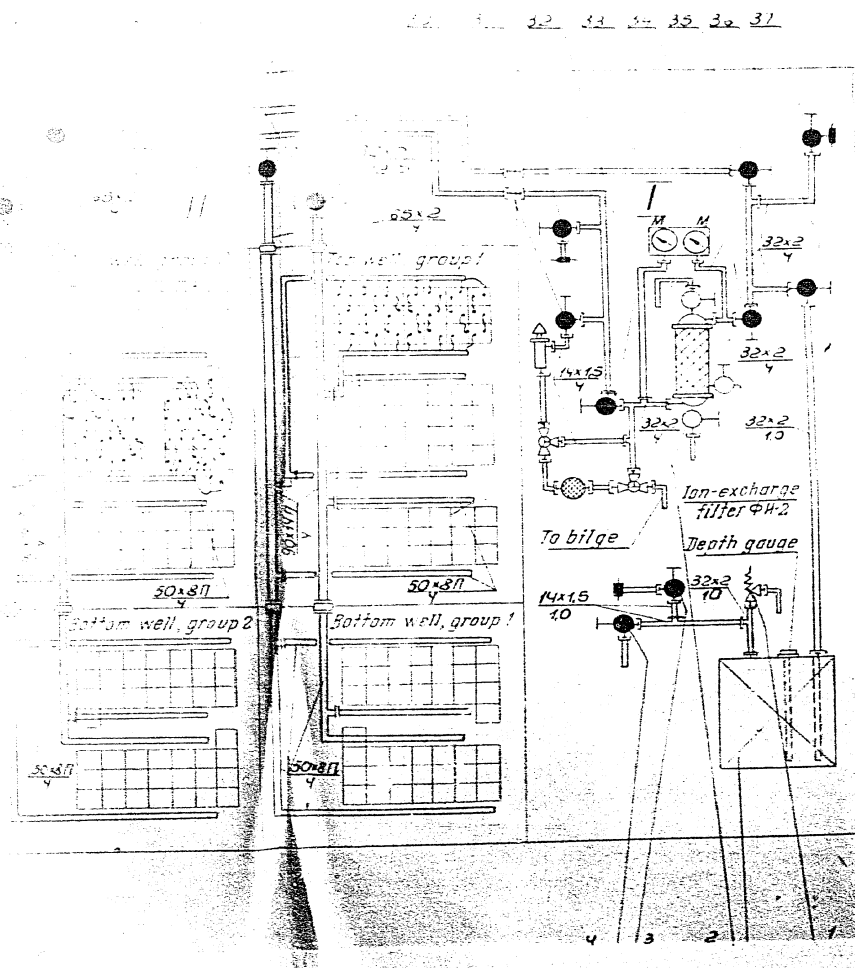


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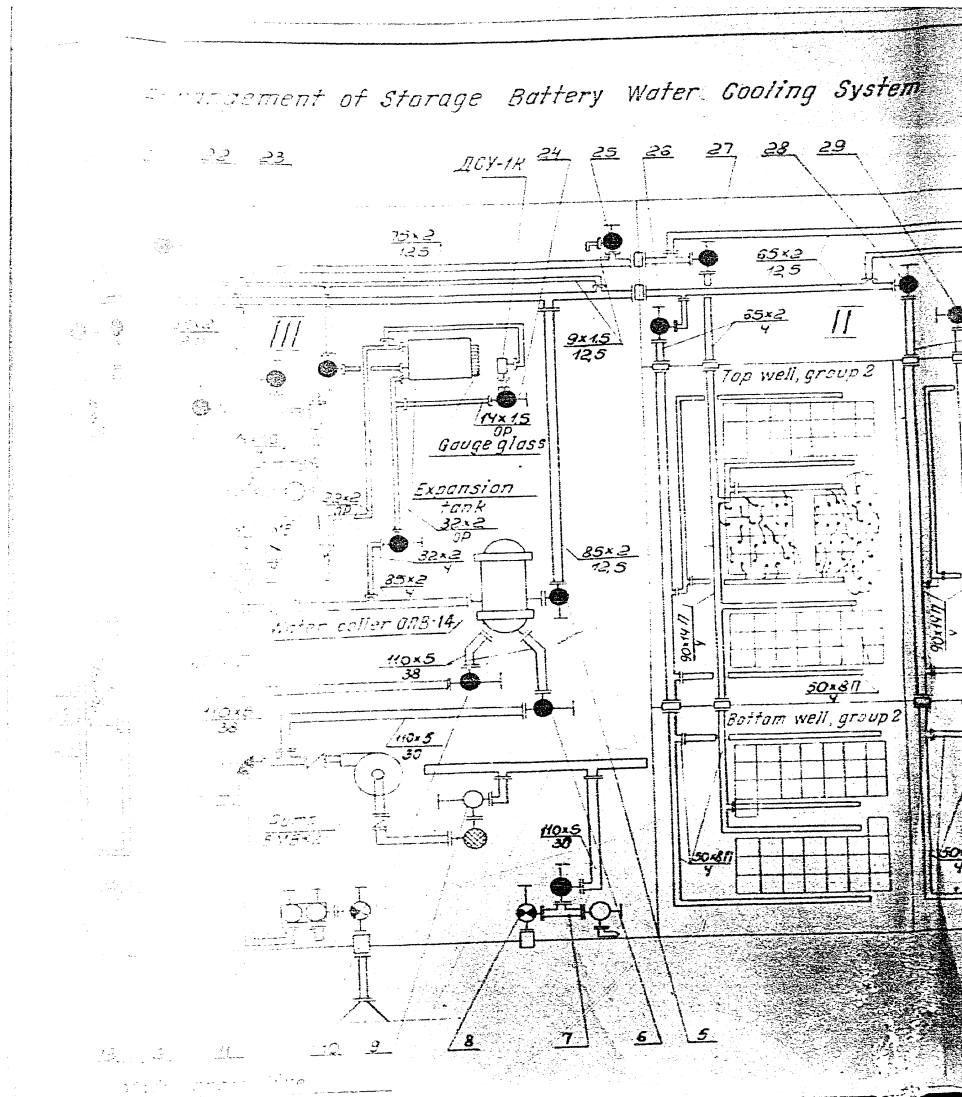


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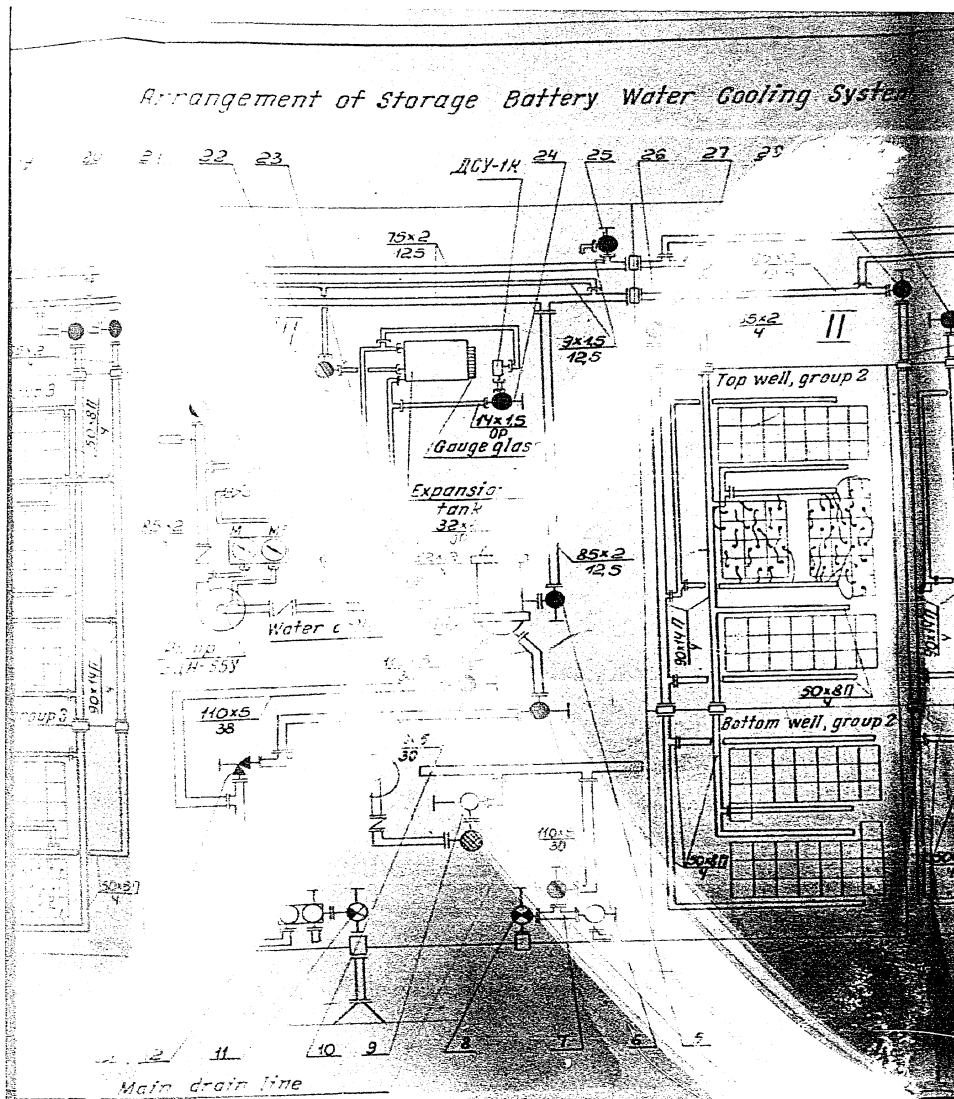


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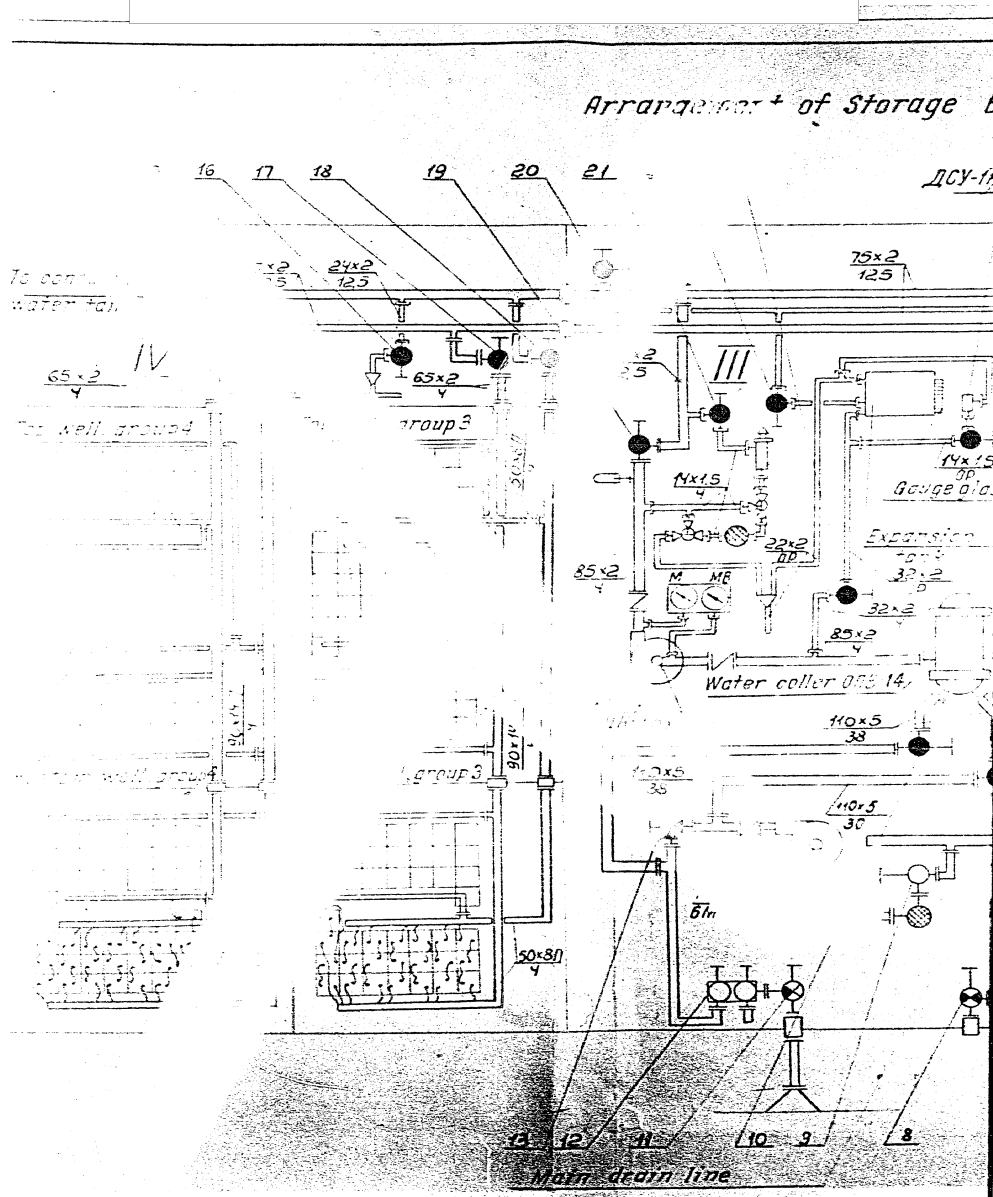


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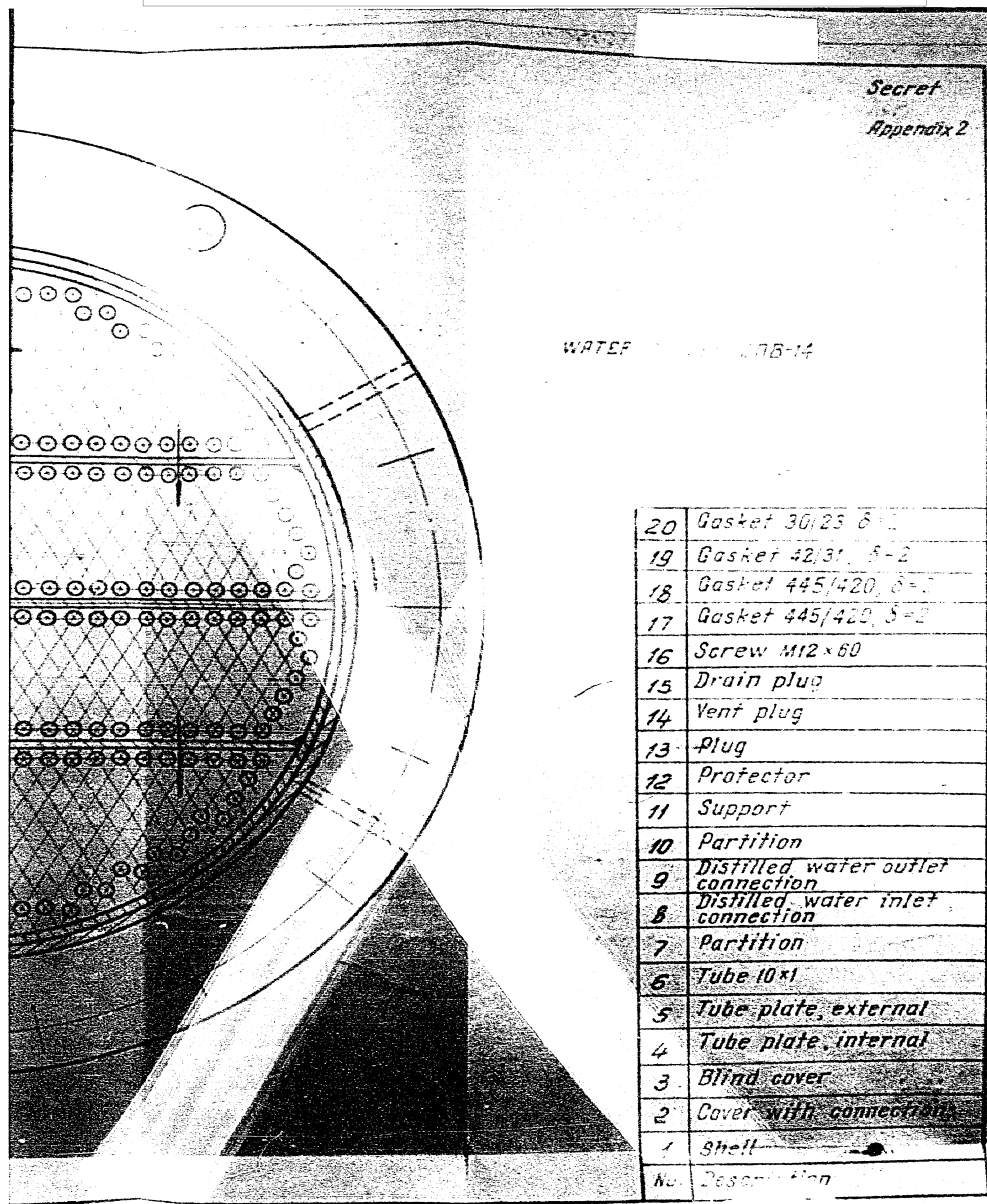
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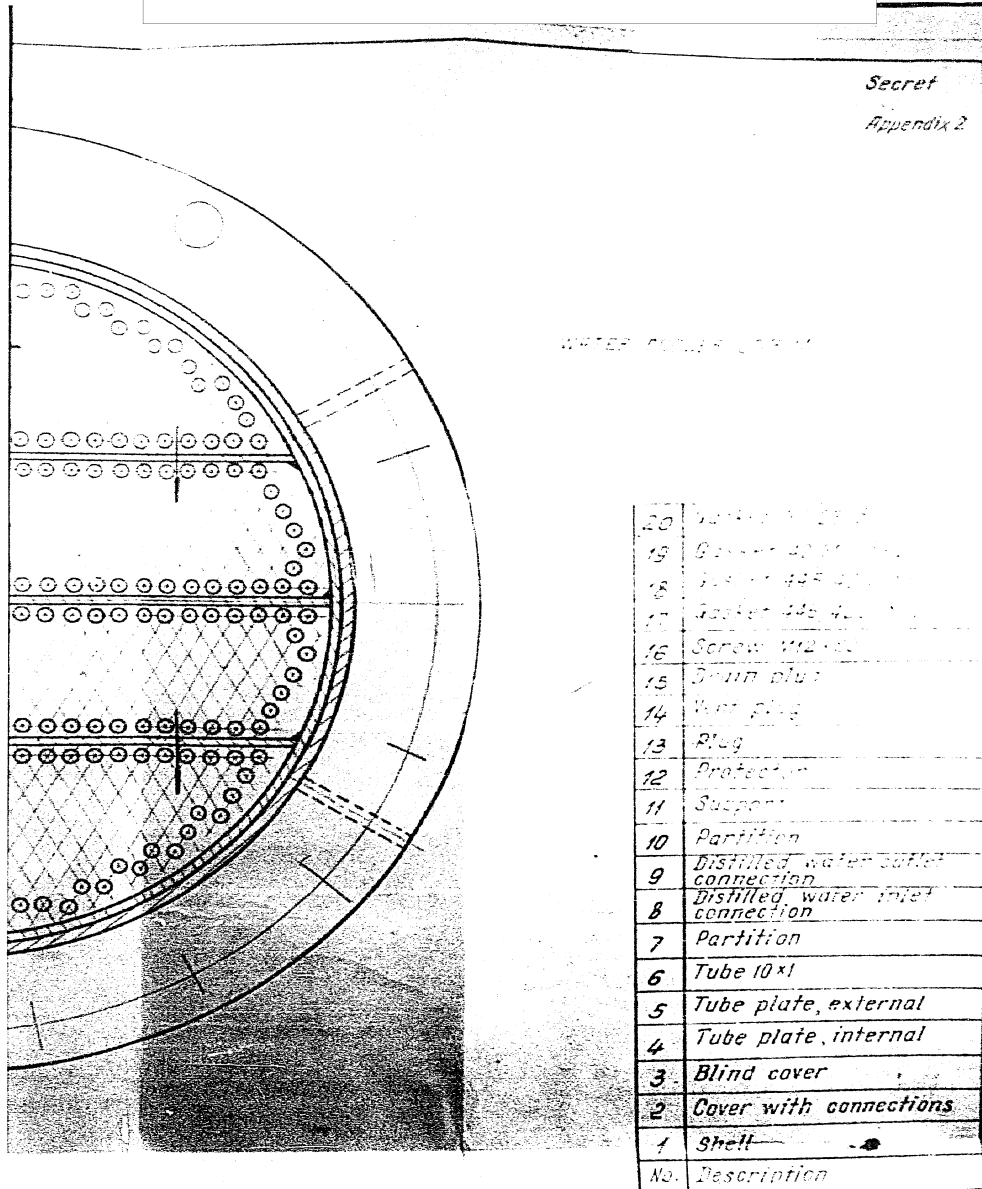


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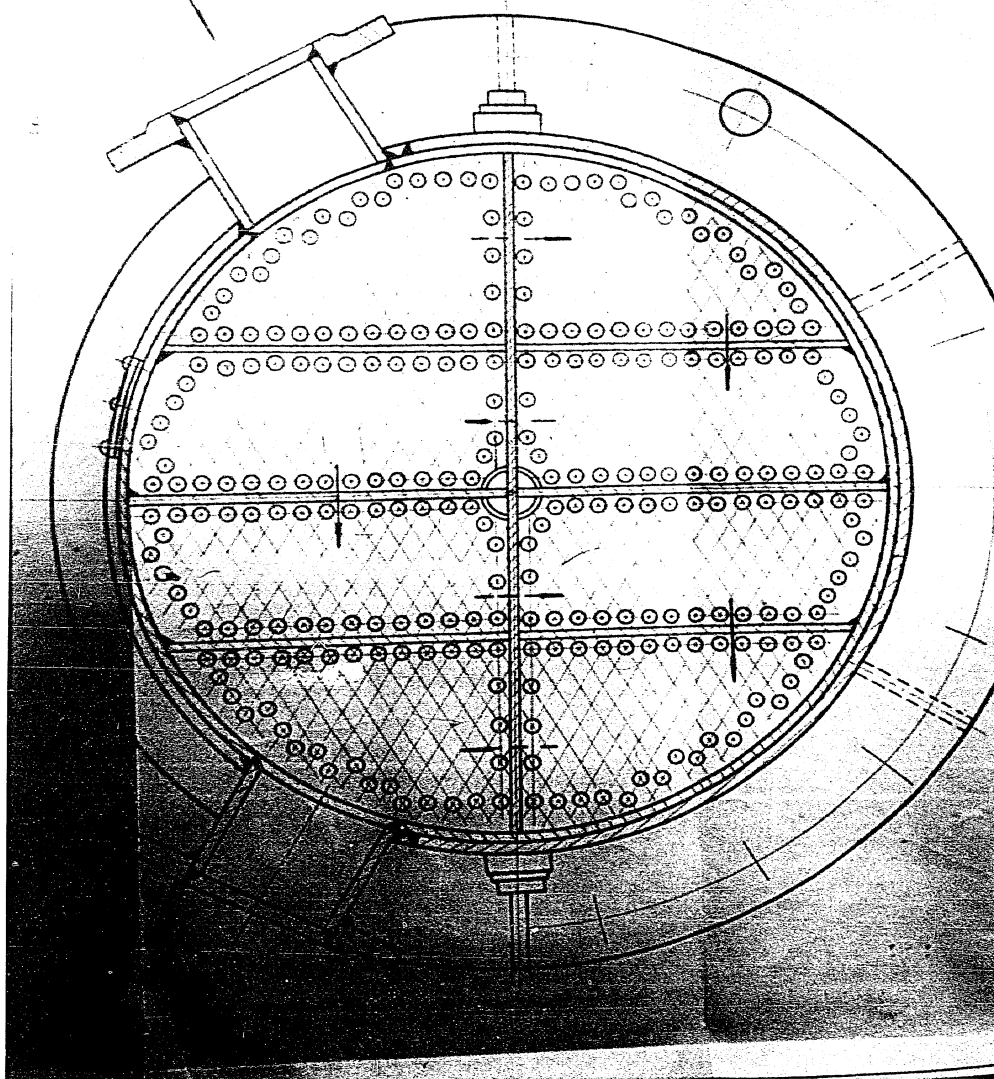
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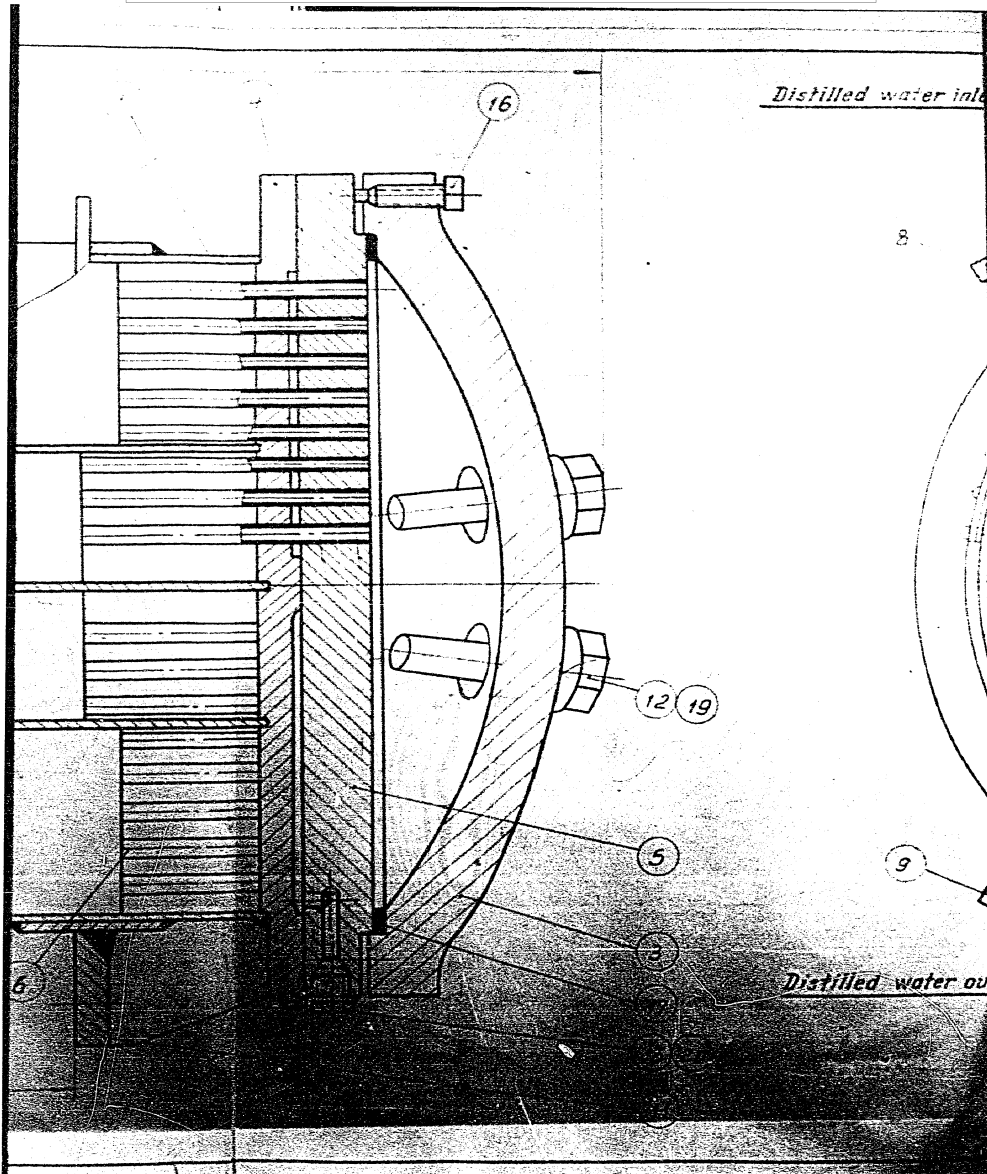


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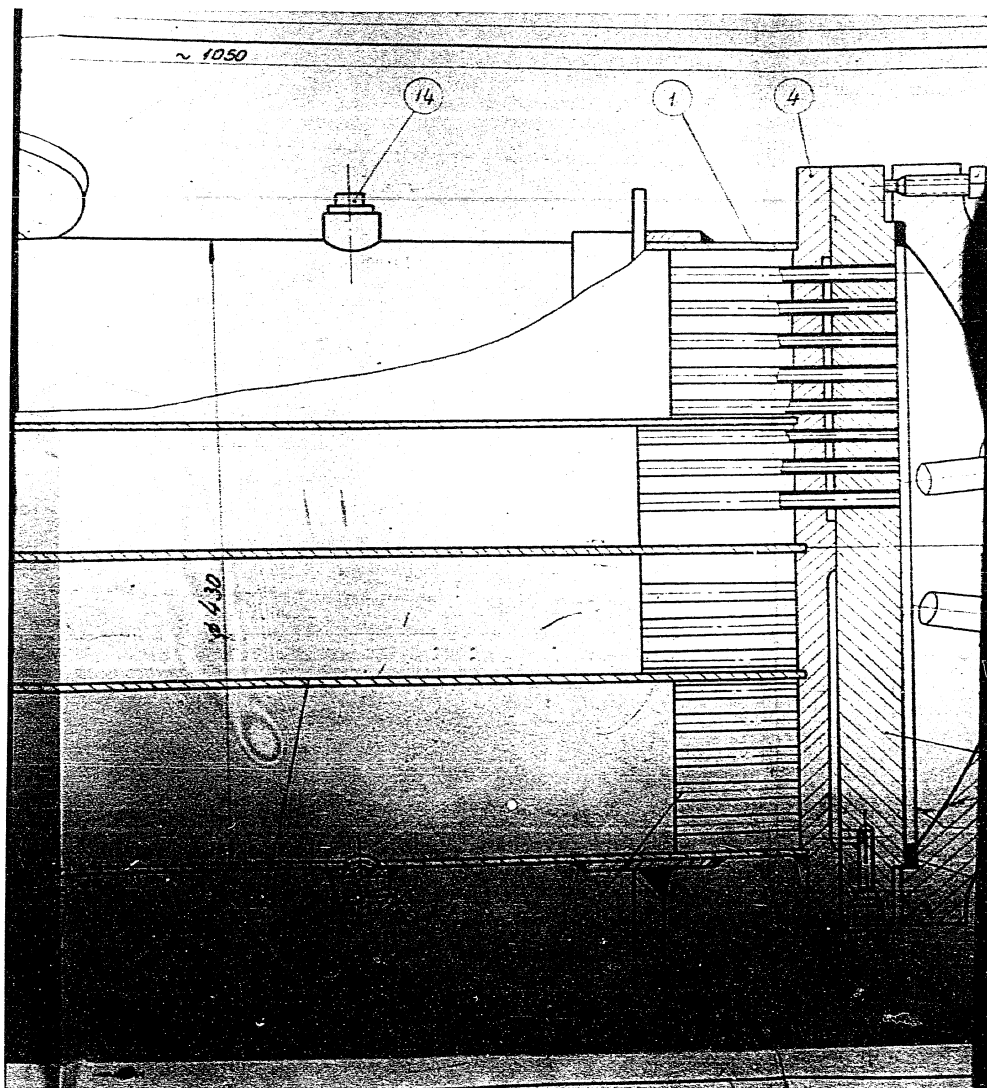


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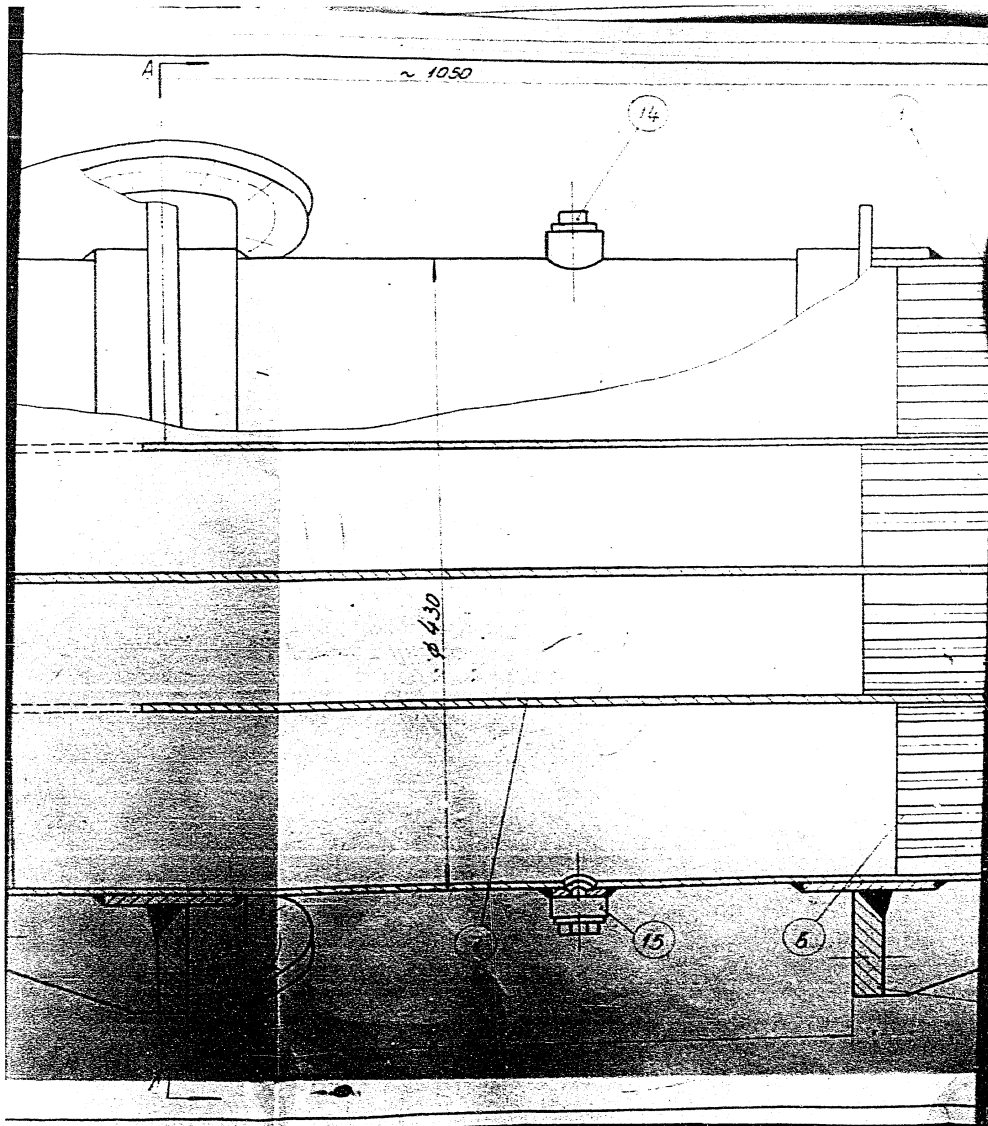


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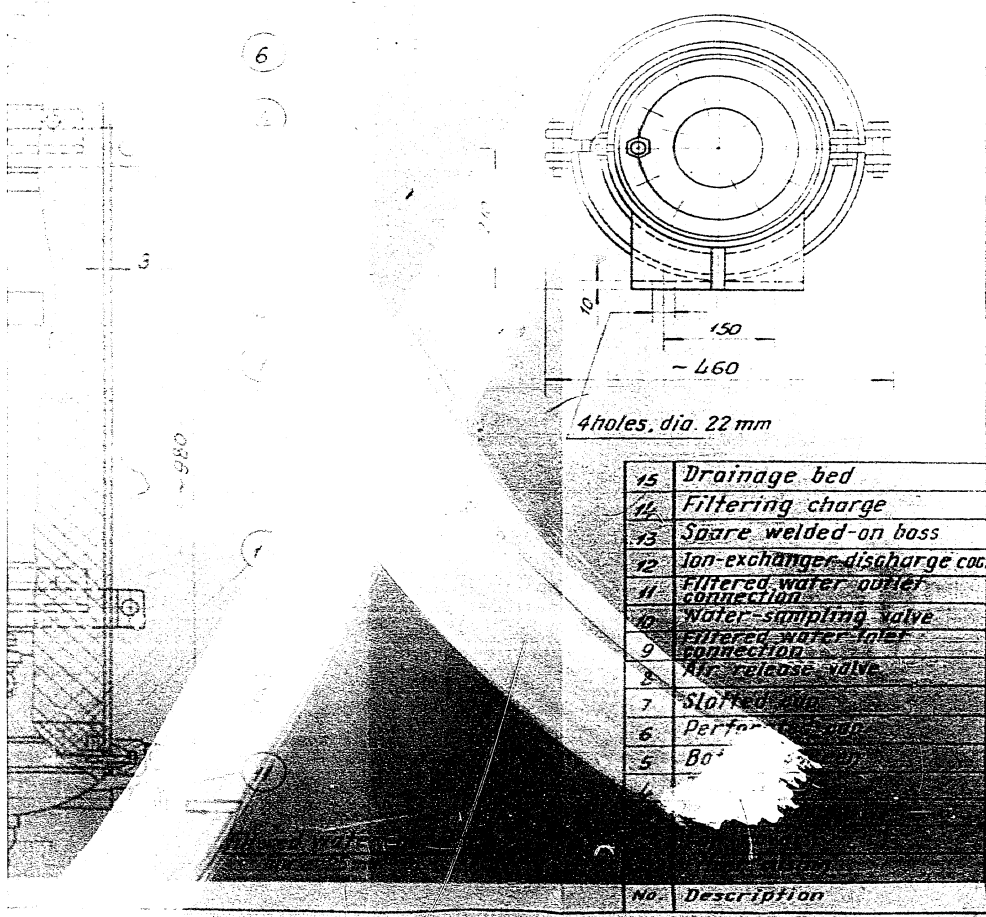
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Appendix 3

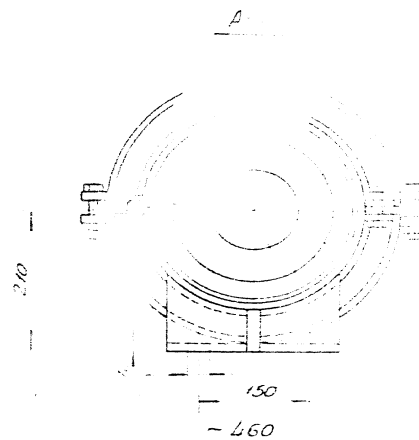
ION-EXCHANGE FILTER ФН-С



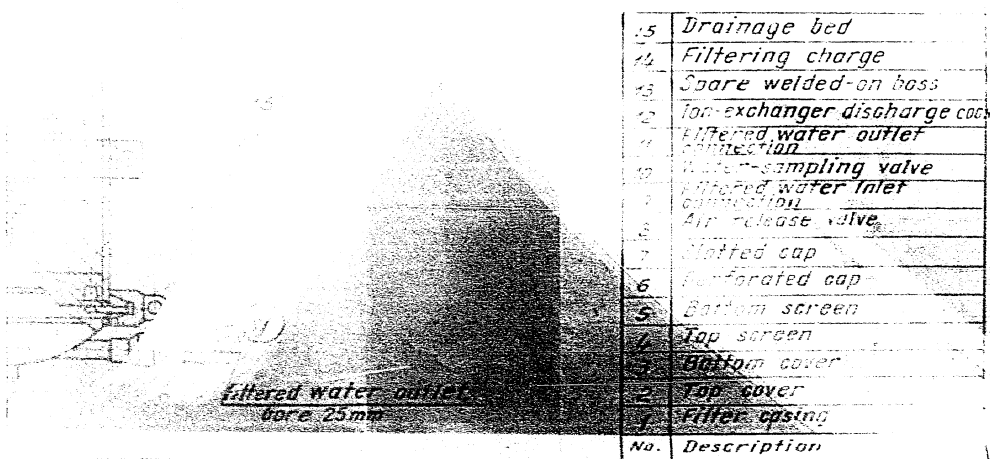
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ION-EXCHANGE FILTER Φ 4-2

Plates, dia 22 mm



15	Drainage bed
14	Filtering charge
13	Spare welded-on boss
12	Ion-exchanger discharge cock
11	Filtered water outlet connection
10	Water-sampling valve
9	Filtered water inlet connection
8	Air-release valve
7	Slotted cap
6	Perforated cap
5	Bottom screen
4	Top screen
3	Bottom cover
2	Top cover
1	Filter casting
No.	Description

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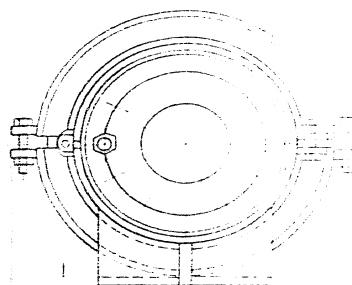
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ION-EXCHANGE FILTER PUMP

A-A



4 holes, dia. 22 mm

15	Drainage bed
14	Filtering charge
13	Spare welded-on boss
12	Ion-exchanger discharge case
11	Filtered water outlet connection
10	Water-sampling valve
9	Filtered water inlet connection
8	Air release valve
7	Slotted cap
6	Perforated cap
5	Bottom screen
4	Top screen
3	Bottom cover
2	Top cover
1	Filter casing
No.	Description

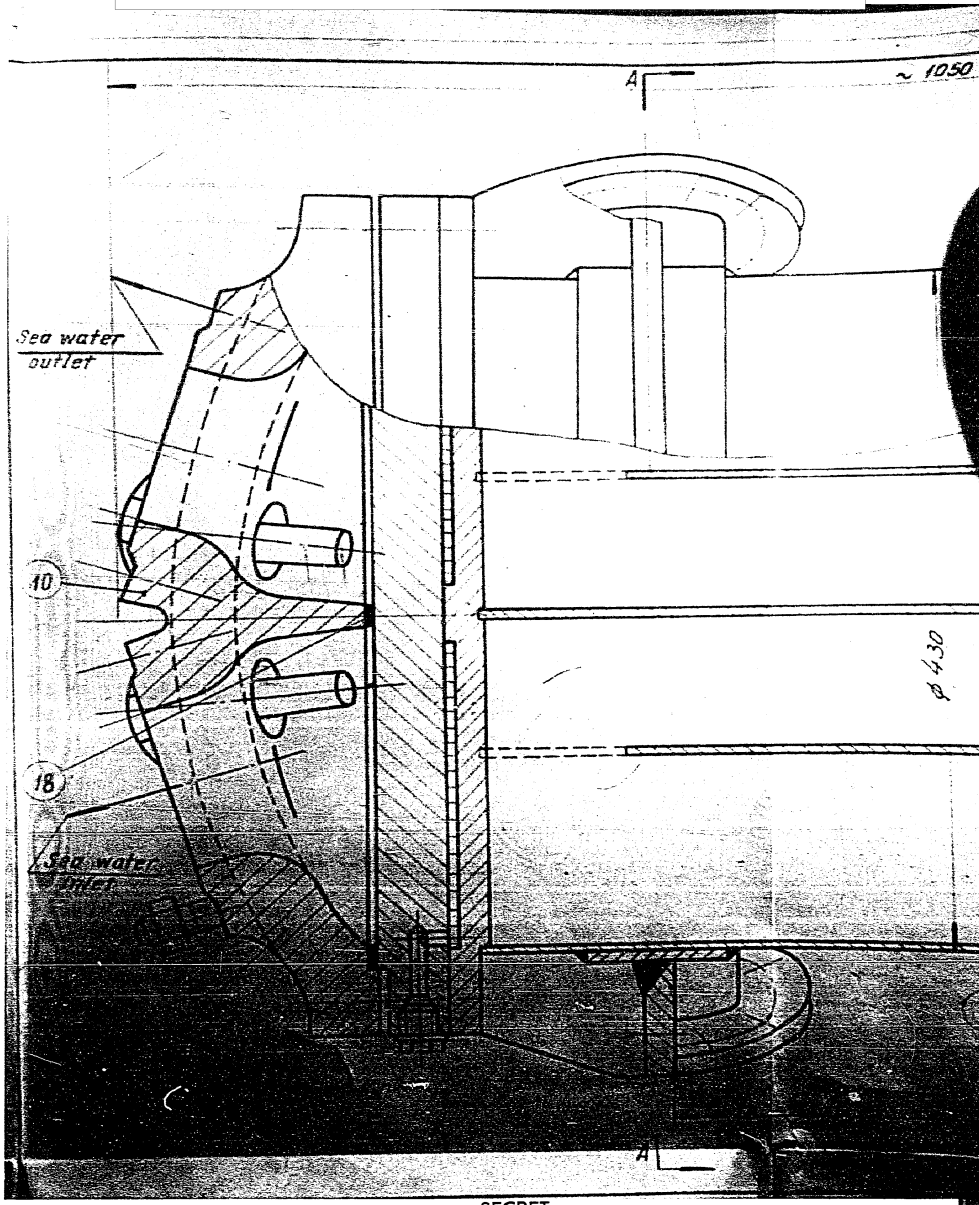
Filtered water outlet
bore 25 mm

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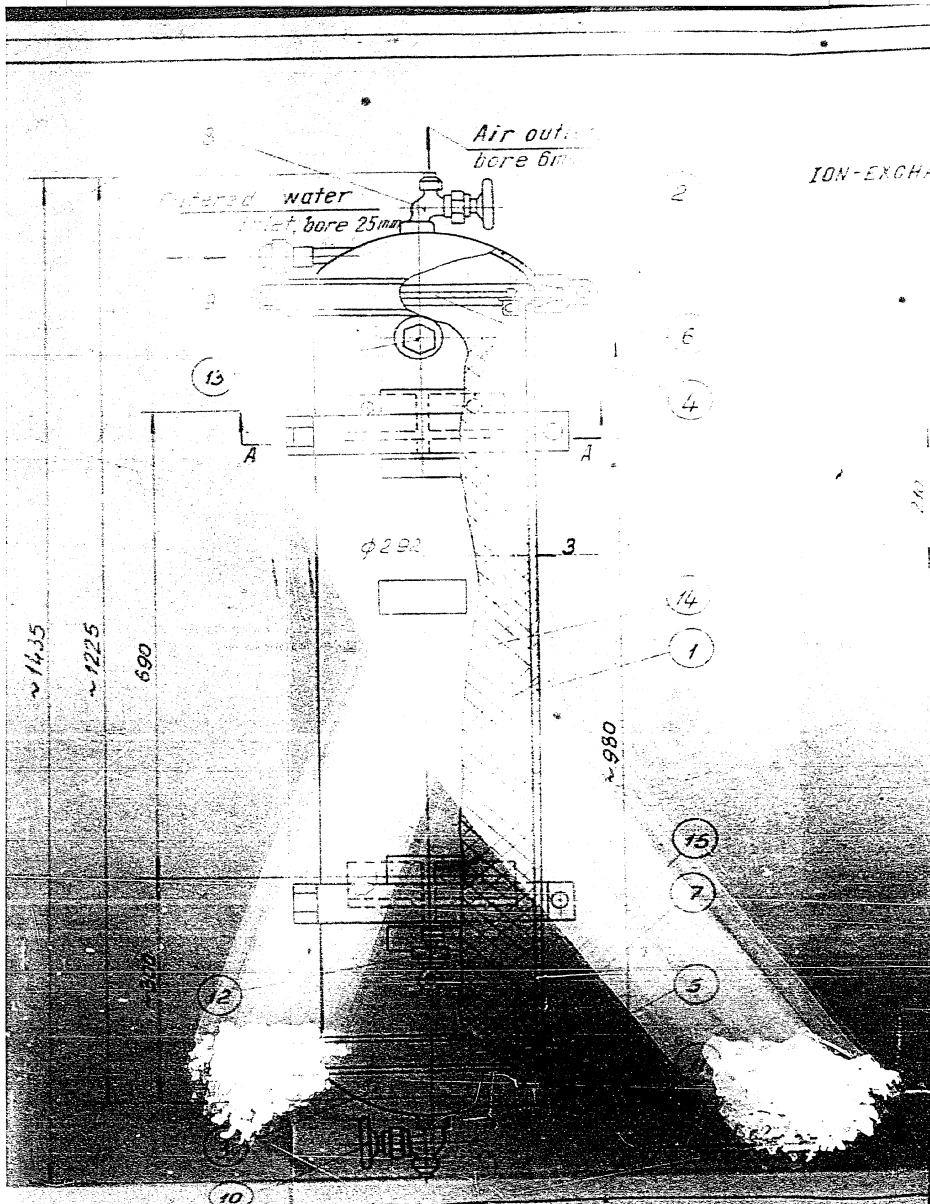


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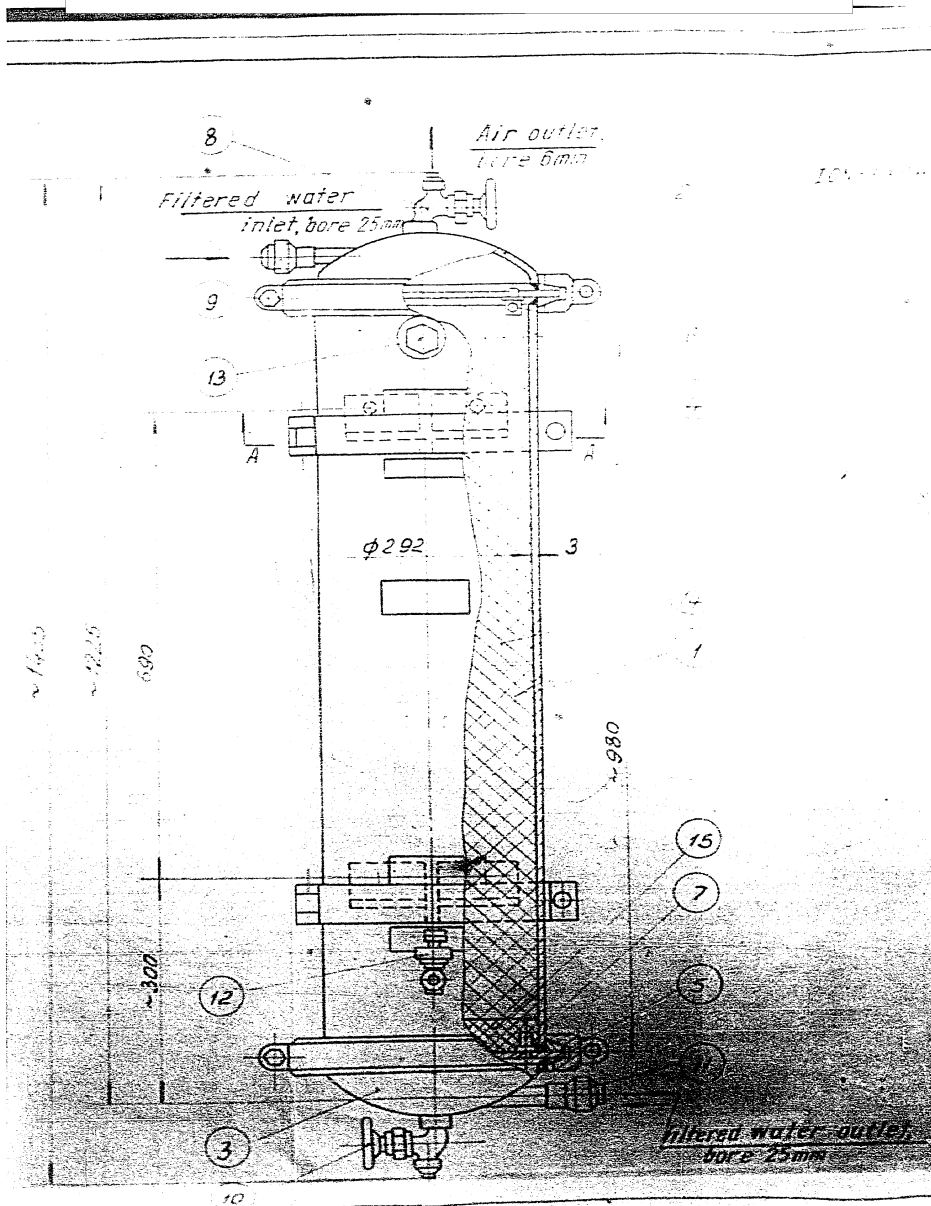


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